

## DESCRIPTION

## PRESCANNING IN IMAGE PRINTING/READING APPARATUS

## 5 TECHNICAL FIELD

The present invention relates to a digital image printing/reading apparatus, and more particularly, to an image printing/reading apparatus having an ink-jet image printing unit.

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## BACKGROUND ART

First, related art of the present invention will be described. Fig. 9 is a cross sectional view of a facsimile apparatus using an ink-jet printing method.

15 A print sheet 901 is placed on a print-sheet holder 903, and fed into the apparatus by a paper feed roller 904 and a separation mechanism (not shown) by one sheet. The fed print sheet 901 is conveyed by a conveyance roller 905 to a printing unit 906. The print sheet is  
20 discharged to the outside of the apparatus (in an arrow B direction) by a paper discharge roller 907 while image printing is performed on the print sheet by an ink-jet image printing mechanism.

On the other hand, a document 902 is placed on a  
25 document holder 908. At this time, the document 902 is set so as to abut on a wedge shaped portion formed with a document separation roller 909 and a separation piece

913. When the document separation roller 909 rotates in accordance with an image reading command, only one of plural documents 902 held with the wedge shaped portion which is in contact with the document separation roller 909 is separated by friction from the other documents 902 and conveyed. The separated and conveyed document 902 is further conveyed by a conveyance roller 910, then discharged to the outside of the apparatus (in an arrow A direction) by a paper discharge roller 912 while image information is read by a contact image sensor 911 or the like.

As the image quality of the document 902 is degraded with ambient light entered from a discharge port into the sensor 911, a light shielding sheet 900 is placed in slight contact with the document 902 for blocking the ambient light (stray light). Note that the contact between the light shielding sheet 900 and the document 902 is made such that the document 902 is not jammed in the apparatus.

Recently, there are increasing needs for downsizing and cost reduction of facsimile apparatuses. In studies to meet the requirements, it has been noted that in the above-described facsimile apparatus, a document conveyance mechanism and a print-sheet conveyance mechanism are separately provided.

That is, it has been considered that if the conveyance mechanism for conveyance of print sheet is

also used as the conveyance mechanism for conveyance of document, the facsimile apparatus can be downsized. Since the conveyance roller, the paper discharge roller and the document driving motor and the like, provided  
5 for document conveyance can be omitted, this structure has seemed advantageous in downsizing and cost reduction.

However, this structure has problems. It is known that if an ink-jet method is used as the printing  
10 method, generally the discharge characteristic is more stabled when ink is discharged right below in comparison with discharging in other directions. In this case, a print sheet is conveyed in a horizontal direction in a printing portion, since the print sheet  
15 is arranged in a direction orthogonal to the ink discharge direction. The image quality is improved if a document is read in a position as close to the conveyance roller as possible. Also, the image quality is improved if a print sheet is subjected to printing  
20 in a position as close to the conveyance roller as possible. In other words, to improve the image quality, it is preferable that a reading unit is positioned around the printing portion, and the reading unit is arranged in the horizontal direction.

25 In a case where the reading unit, which is an immobile but fixed unit, is positioned around the printing portion, a first problem is that a reference

white board of the reading unit is soiled with ink upon printing.

For example, in facsimile apparatuses, generally a reference white board is read by prescanning for  
5 light amount control in the contact image sensor and acquisition of shading data. If the reference white board is soiled with ink in the prescanning, proper data cannot be obtained, and as a result, a read image is degraded.

10 Further, in some apparatuses, a movable reading unit is employed as disclosed in Japanese Published Unexamined Patent Application No. Hei 08-181820. However, as the reading unit is provided immediately below a printhead and driven upward/downward, if ink is  
15 erroneously discharged upon failure of conveyance of print sheet, the reference white board may be soiled with the discharged ink leaked through a platen board.

Further, a reading position of the above-described reading unit is in close vicinity to the  
20 paper discharge port of the document. As the ambient light (stray light) from the paper discharge port has a damaging effect on prescanning, a second problem is that a read image is degraded.

Further, as a third problem, if a paper jam with  
25 a document or print sheet occurs in the reading position, the document or print sheet disturbs a prescanning operation in the reading position.

## DISCLOSURE OF THE INVENTION

The present invention provides an image printing/reading apparatus in which commonality of  
5 print sheet path and document path is realized at least in a part. A reading unit to read a document is movable between a first position to read a document and a second position to which the unit is retreated during standby time. Particularly, prescanning is performed  
10 by the reading unit in a position where the influence of stray light is reduced (for example, the second position).

Further, it may be arranged such that a reference white board for shading correction is provided in a  
15 position where it is not soiled with ink (for example, the second position). For example, in a case where the reference white board is moved with the reading unit, the reference white board is moved to the second position at least upon printing. Note that the reading  
20 unit and the reference white board may be moved to the second position during standby time.

Other features and advantages of the present invention will be apparent from the following description taken in conjunction with the accompanying  
25 drawings, in which like reference characters designate the same name or similar parts throughout the figures thereof.

## BRIEF DESCRIPTION OF THE DRAWINGS

The accompanying drawings, which are incorporated in and constitute a part of the specification, illustrate embodiments of the invention and, together with the description, serve to explain the principles of the invention.

Fig. 1 is a cross sectional view of an image printing/reading apparatus according to a first embodiment of the present invention, particularly showing a status where a reading unit exists in a standby position (retreat position);

Fig. 2 is a perspective view of the image printing/reading apparatus in Fig. 1;

Fig. 3 is a cross sectional view of the image printing/reading apparatus upon reading operation;

Fig. 4 is a perspective view of the image printing/reading apparatus upon reading operation;

Fig. 5 is a block diagram showing a system configuration of the image printing/reading apparatus according to the first embodiment;

Fig. 6 is a flowchart showing reading operation processing according to the first embodiment;

Fig. 7 is a schematic cross sectional view showing the position of a jam detection sensor according to a second embodiment of the present invention;

Fig. 8 is a flowchart showing jam error processing according to the second embodiment; and

Fig. 9 is a cross sectional view of the 2-path type apparatus as the related art of the present invention.

#### BEST MODE FOR CARRYING OUT THE INVENTION

Preferred embodiments of the present invention will now be described in detail in accordance with the accompanying drawings.

The present embodiment provides an image printing/reading apparatus including: a printing unit to print an image on a print sheet conveyed through a print sheet path; a reading unit to read a document conveyed through a document path, having a common part belonging to the print sheet path and the document path; a reference white board for shading correction used by the reading unit upon execution of prescanning; a moving unit to move the reading unit and the reference white board to a document reading position when the reading unit executes document reading, on the other hand, to move the reading unit and the reference white board to a retreat position in which the influence of ambient light is prevented at least upon execution of prescanning; and a prescanning control unit to perform prescanning when the reading unit and the reference white board are in the retreat position.

Fig. 1 is a cross sectional view of the image printing/reading apparatus according to the present embodiment, particularly showing a status where a reading unit 28 exists in a standby position (retreat position). Fig. 2 is a perspective view of the image printing/reading apparatus in Fig. 1. In the image printing/reading apparatus, a printing unit having a printing function of printing an image on a print sheet 2 as a print medium, and the reading unit 28 having a reading function of reading a document as a subject of reading, are provided approximately in the vicinity of a common path for conveyance of print sheet and document.

In Fig. 1, in the rear of the apparatus (right side of Fig. 1), a print-sheet feeding unit (ASF) 39 and a document feeding unit (ADF) 40 are provided. The print-sheet feeding unit 39 holds a stack of print sheets 2, and separates the print sheets one by one from the stack of the print sheets 2 and feeds them to a printing unit 38, in accordance with necessity. The document feeding unit (ADF) 40 holds documents 12, and separates the documents one by one and feeds them to the reading unit 28.

An ink tank and an ink head 65 are mounted on an ink cartridge 1. The ink cartridge 1 is removably attached to a carriage 4. The carriage 4 is guided by a guide shaft 60 supported with a guide rail 7 and both



side plates of a chassis, and is supported movably in a print-sheet widthwise direction. Further, the carriage 4 is driven by a carriage motor. When image formation is not performed, as the ink cartridge 1 must be capped by a nozzle cap function, the cartridge is stopped at a right end within a carriage moving range.

Fig. 3 is a cross sectional view of the image printing/reading apparatus upon reading operation; and Fig. 4, a perspective view of the image printing/reading apparatus upon reading operation. The reading unit 28 includes a contact image sensor (CIS) 22, a CIS holder 26, and a reference white board 25. The CIS 22 is accommodated, with its sensor surface 66 facing outwardly, in a concave portion formed in the CIS holder 26 and screw-fixed there. The reference white board 25 is attached to the CIS holder 26. The reference white board 25 is formed by attaching a white sheet 25a to a metal plate. The metal plate has a flat surface to which the white sheet 25a is attached and a side plate formed by folding end portions in lengthwise direction. When the document 12 is read, the document 12 is guided to an entrance 70 formed between the CIS 22 and the white sheet 25a.

The CIS holder 26 is rotatable and movable between a first position (reading position) as shown in Figs. 3 and 4 and a second position (standby position) as shown in Figs. 1 and 2. Note that as the second

position exists in a cover of the unit, the influence of stray light is prevented. Further, as the second position is higher than the ink head (ink discharge portion) 65, even if ink is discharged upon failure of conveyance of print sheet, the CIA 22 and the reference white board 25 can be prevented from being soiled with the discharged ink.

Next, the movement of the CIS holder 26 between the standby position and the reading position will be described in detail. As the CIS holder 26 is pressed by a torsion coil (not shown), it is held in the standby position as shown in Figs. 1 and 2 at normal times. On the other hand, when a reading operation is requested, the carriage 4 moves to the left end, then drive selection means 52 is operated by using a cam member 94 attached to the carriage 4, and the driving force of the conveyance motor is transmitted to the reading unit 28. Further, when the conveyance motor is rotated in a normal direction, the driving force is transmitted via CIS drive transmission means 73 to CIS drive means 74, and the CIS holder 26 is moved from the standby position to the reading position. When the CIS holder 26 has moved to the reading position, a clutch coupling the CID drive means 74 to the CIS drive transmission means 73 is removed, and the CIS holder 26 is stopped in the position. Note that when the CIS holder 26 is moved from the reading position to the

standby position, the conveyance motor is rotated in the reverse direction, and as a result, the CIS drive means 74 and the CIS drive transmission means 73 are coupled with the clutch, and the CIS holder 26 is  
5 returned to the standby position.

Fig. 5 is a block diagram showing a system configuration of the image printing/reading apparatus according to the present embodiment. A CPU 101 is a control unit to control the entire apparatus via a  
10 system bus.

A ROM 102 is a storage device in which program code such as an operation instruction group, operating system (OS) program code, initial value data, table data and the like are stored.

15 A RAM 103 is a storage device used as an image buffer, an image memory or the like, and also used as a buffer for temporarily storing image data transmitted/received by a facsimile function. Further, the RAM 103 is used as a memory for storing received  
20 image data as a file. The RAM 103 is protected with battery backup from an accident fault such as power outage.

An operation display unit 104 is provided with key switches including ten keys used upon dialing  
25 operation, data registration processing and function setting processing, function keys for using various functions, single-touch keys used for single-touch

dialing registered telephone numbers, a start key used upon start of transmission, reception and copying, and a stop key used for stoppage of transmission, registration and setting, an LCD (liquid crystal display device) to display various messages for checkup of communication status, data registration, setting and the like, and a lamp turned on during communication and a lamp turned on upon occurrence of various errors (LEDs or the like). The status of the apparatus, the telephone number of the receiver of an originated call, time information, an operation procedure and the like are displayed on the operation display unit 104.

The contact image sensor (CIS) 22 converts an image optically read at a predetermined resolution into an electric image signal. Further, the contact image sensor 22 reads the reference white board 25 to obtain shading data.

An image processing unit 106 performs shading correction or the like on the signal from the CIS 22, and further performs image processing such as binarization processing, halftone processing and the like on the signal, and outputs high-definition image data. Further, the image processing unit 106 obtains the shading data from the data on the reference white board 25 read by the CIS 22.

A printing unit 107 has an ink jet cartridge, a motor to drive the cartridge and a drive controller to

perform drive control.

An image processing unit 108 performs various image processings such as resolution conversion processing to convert image data in main-scanning resolution of 8 pel/mm to image data in main-scanning resolution of 360 dpi (dots per inch) for the printer, smoothing processing and density correction processing, thereby generates high-definition image data and outputs the data to the ink head 65.

10       A conveyance unit 109 has a paper conveyance motor to convey a document and a print sheet through a one-path conveyance channel as a common path belonging to a print sheet path and a document path, a paper conveyance controller to control the paper conveyance  
15       motor, and a sensor to detect statuses of the document and the print sheet. Further, the paper conveyance motor is also used as drive means by changing its driving direction for moving the CIS unit.

A sensor 110 includes a document detection (DS)  
20       sensor and a rear-end detection (PE) sensor. The DS sensor detects the existence/absence of document, and the PE sensor detects a paper rear end on the one-path conveyance line. For example, the CPU 101 determines whether or not a jam has occurred in accordance with  
25       the status of the sensor 110.

Fig. 6 is a flowchart showing reading operation processing according to the present embodiment. In an

initial status, the cartridge is in the home position, and the CIS 22 and the reference white board 25 are in the standby position.

At step S601, the CPU 101 detects that the start  
5 key on the operation display unit 104 has been depressed so as to start reading. Note that in the first embodiment, as jam detection is not performed, explanations of steps S602, S608 and S610 in Fig. 6 will be omitted.

10 At step S603, the CPU 101 performs prescanning operation. More particularly, the CPU 101 controls the CIS 22 in the standby position to read the reference white board 25, to obtain shading data and output the data into the image processing unit 108. Note that the  
15 CPU 101 detects whether or not the CIS holder 26 having the CIS 22 is in the standby position, and if the CIS holder 26 is in the standby position, the CPU 101 performs prescanning, while if the CIS holder 26 is not in the standby position, the CPU 101 rotates the  
20 conveyance motor in the reverse direction, to couple the CIS drive means 74 to the CIS drive transmission means 73 with the clutch, to move the CIS holder 26 to the standby position. In this manner, as it is detected by using the sensor (not shown) whether or not  
25 the CIS holder 26 exists in the standby position, even if the CIS holder 26 accidentally does not exist in the standby position, the CIS holder 26 can be moved to the

standby position and prescanning can be performed.

At step S604, the CPU 101 moves the CIS 22 and the reference white board 25 to the reading position. More particularly, the CPU 101 rotates the conveyance  
5 motor in the normal direction, to transmit the driving force to the CIS drive means 74, and move the CIS holder 26 from the standby position to the reading position.

At step S605, the CPU 101 drives a paper feed  
10 roller 19 to feed a document to the reading start position.

At step S606 the CPU 101 operates the CIS 22 to read the document by 1 line.

At step S607, the CPU 101 determines whether or  
15 not the reading processing has been completed. If it is determined that the reading processing has been completed, the process proceeds to the next step, otherwise, returns to step S606.

At step S609, the CPU 101 moves the CIS 22 and  
20 the reference white board 25 to the standby position, and ends the reading processing.

According to the present embodiment, in an image printing/reading apparatus in which commonality of print sheet path and document path is at least  
25 partially realized as a common path, reading means for reading a document is movable between a reading position and a standby position, and particularly, the

reading means performs prescanning in a position where the influence of ambient light from a discharge port is reduced (e.g., the standby position). As a result, the degradation of image due to ambient light can be

5 reduced. Note that the standby position may be any position as long as it is in the casing of the printing/reading apparatus and away from the reading position. Further, the distance between the standby position and the reading position may be an arbitrary

10 distance as long as the influence of ambient light from the discharge port can be reduced.

Further, according to the present embodiment, provided is an image printing/reading apparatus comprising: a printing unit to print an image on a

15 print sheet conveyed through a print sheet path; a reading unit to read a document conveyed through a document path, having a common part belonging to the print sheet path and the document path; a reference white board for shading correction used by the reading

20 unit upon execution of prescanning; and a moving unit to move the reading unit and the reference white board to a document reading position when the reading unit executes document reading, on the other hand, to move the reading unit and the reference white board to a

25 retreat position, e.g. in a direction deviated from a color material discharging direction, in which the influence of printing color material is reduced at



least when the printing unit executes printing; and a prescanning control unit (e.g. the CPU 101) to perform prescanning when the reading unit and the reference white board are in the retreat position.

5           That is, as the reference white board 25 for shading correction is retreated to at least a position where it is difficult to be soiled with ink upon image printing (e.g., the standby position), even in a case where ink is directly discharged while a print sheet is  
10 not conveyed, the reference white board 25 can be prevented from being soiled with the ink.

          Further, according to the present embodiment, as the standby position of the reference white board 25 is higher than the ink head 65, even if ink is discharged  
15 upon failure of conveyance of print sheet, the reference white board 25 can be prevented from being soiled with ink. Further, the standby position may be moved by the width of ink head or greater in the same or inverse direction of the print-sheet conveyance  
20 direction. In this case, more preferable shading correction data can be obtained. This can further improve the image quality of read image, and by extension, improve the image quality of printed image.

## 25   [Second Embodiment]

          The present embodiment is provided so as to solve the problem that when a paper jam occurs in the reading

position, the document or print sheet jammed therein disturbs a prescanning operation. In the present embodiment, a detection unit to detect a jam occurred in a common path belonging to the print sheet path and the document path is provided, and if a jam is not  
5 detected, prescanning is performed in the retreat position. Note that it goes without saying that the present invention is applicable to solutions to other problems.

10        Fig. 7 is a schematic cross sectional view showing the position of a jam detection sensor according to the present embodiment. Reference numeral 80 denotes a DS sensor which detects a document placed on a document holder 11; and 81, a PE sensor which  
15 detects a document and a print sheet. The sensors 80 and 81 are positioned on a path where reading and printing overlap each other. Based on detection outputs from the two sensors and the position of the paper feed roller 19, the CPU 101 detects a jam.

20        Next, the reading processing with execution of jam detection will be described with reference to the flowchart of Fig. 6. Note that explanations of processing described in the first embodiment will be omitted.

25        At step S602, the CPU 101 determines whether or not a jam has occurred, i.e., whether or not paper exists in the conveyance path, based on detection

information from the DS sensor 80 and detection  
information from the PE sensor 81 and position  
information of the paper feed roller 19. If a jam has  
occurred, the process proceeds to error processing at  
5 step S610. If a paper jam has not occurred, a  
prescanning operation is performed at step S603.

If the reading processing (S607) has been  
completed, the CPU 101 performs jam detection at step  
S608. If a jam has occurred, the process proceeds to  
10 the error processing at step S610. If a jam has not  
occurred, the CIS 22 and the reference white board 25  
are moved to the standby position, and the reading  
processing ends.

Fig. 8 is a flowchart showing jam error  
15 processing according to the present embodiment. The  
flowchart shows the details of the above-described step  
S610.

At step S801, the CPU 101 displays the status of  
occurrence of paper jam on the LCD of the  
20 operation/display unit 104. At step S802, jam release  
processing is performed. More particularly, the CPU  
101 detects the user's depressing a jam release button.  
It may be arranged such that when the user has  
depressed the jam release button and the paper has been  
25 removed, the CIS 22 is automatically moved to the  
second position (standby position) by a spring attached  
to the shaft of the CIS holder 26. At step S803, the

CPU 101 displays a message instructing to depress the stop key on the LCD of the operation/display unit 104. Then the CPU 101 detects the user's depressing the stop key. When the stop key has been depressed, paper jam  
5 detection is performed at step S804. If a paper jam has not occurred, the CPU 101 moves the cartridge to the home position at step S805, to set the apparatus in the standby status.

Note that it may be arranged such that the CPU  
10 101 performs paper jam detection at step S803, and if a paper jam has not occurred, the CPU 101 displays a message instructing to depress the stop key on the LCD of the operation/display unit 104, then at step S804, the CPU 101 detects the user's depressing the stop key.  
15 That is, the processings at steps S803 and S804 may be interchanged.

According to the present embodiment, as  
prescanning is performed in the retreat position, the influence of jam can be reduced. Further, prescanning  
20 can be performed in the standby position when a jam has not been occurred.

#### [Other Embodiments]

In the above-described embodiments, as the  
25 reference white board 25 and the CIS 22 form one reading unit, the both elements move, integrally with each other, between the retreat position and the

reading position. However, in the structure where the reference white board 25 can be read in the retreat position, these elements are not necessarily integrated. For example, it may be arranged such that the reference  
5 white board 25 and the CIS 22 are separately provided and independently moved. Note that in a case where these elements are integrated, the mechanism for movement can be more simple and the cost of production can be further reduced in comparison with the case  
10 where the reference white board 25 and the CIS 22 are separately provided and independently moved.

Further, it may be arranged such that prescanning is performed in any other position than the standby position (e.g., the reading position) at normal times  
15 and only upon occurrence of jam, the reading unit is moved to a position where the influence of the occurrence of jam is prevented (e.g., the standby position) and prescanning is performed there.

As described above, according to the present  
20 invention, in a so-called one-path type image printing/reading apparatus, prescanning is performed in a retreat position, thereby the apparatus can be downsized, and the influence of stray light from a print-sheet discharge port on shading data can be  
25 reduced.

The present invention can be applied to a system constituted by a plurality of devices, or to an

apparatus comprising a single device. Furthermore, it goes without saying that the invention is also applicable to a case where the object of the invention is attained by supplying a program to a system or  
5 apparatus.

As many apparently widely different embodiments of the present invention can be made without departing from the spirit and scope thereof, it is to be understood that the invention is not limited to the  
10 specific embodiments thereof except as defined in the appended claims.